

CLAIMS

What is claimed is:

- 1 1. A method for forming a gate dielectric for an integrated circuit device,
2 the method comprising:
3 forming an initial oxynitride layer upon a substrate material, said
4 oxynitride layer having an initial physical thickness; and
5 subjecting said initial oxynitride layer to a plasma nitridation, said
6 plasma nitridation resulting in final oxynitride layer, said final oxynitride layer having
7 a final physical thickness.
- 1 2. The method of claim 1, wherein said final physical thickness exceeds
2 said initial thickness by less than 5 angstroms.
- 1 3. The method of claim 1, wherein said final physical thickness is less
2 than 20 angstroms.
- 1 4. The method of claim 1, wherein said final oxynitride layer has an
2 equivalent oxide thickness of less than 15 angstroms.
- 1 5. The method of claim 1, wherein said final oxynitride layer has a
2 nitrogen concentration of at least 2.0×10^{15} atoms/cm².

1 6. The method of claim 1, wherein said initial oxynitride layer is formed
2 upon said substrate by:

3 ionically implanting nitrogen atoms into said substrate; and
4 oxidizing said substrate, following said substrate being ionically
5 implanted with nitrogen atoms.

1 7. The method of claim 1, wherein said initial oxynitride layer is formed
2 upon said substrate by rapid thermal nitric oxide (NO) deposition.

1 8. The method of claim 6, wherein said final oxynitride layer further has a
2 reduction in effective electron mobility, μ_{eff} , of less than 20% from the effective
3 electron mobility of said initial oxynitride layer.

1 9. A gate dielectric for an integrated circuit device, the gate dielectric
2 comprising:
3 an oxynitride layer formed upon a substrate;
4 said oxynitride layer having a film thickness of less than 20 angstroms;
5 and
6 said oxynitride layer further having a nitrogen concentration of at least
7 2.0×10^{15} atoms/cm².

1 10. The gate dielectric of claim 9, wherein said oxynitride layer further
2 has an equivalent oxide thickness of less than 15 angstroms.

1 11. The gate dielectric of claim 9, wherein said oxynitride layer further
2 comprises:
3 an initial oxynitride layer formed by rapid thermal nitric oxide (NO)
4 deposition upon a substrate material; and
5 a final oxynitride layer, said final oxynitride layer formed from said
6 initial oxynitride layer by subjecting said initial oxynitride layer to a plasma
7 nitridation.

1 12. The gate dielectric of claim 9, wherein said oxynitride layer further
2 comprises:
3 an initial oxynitride layer formed by oxidizing a substrate material
4 which has been implanted with nitrogen atoms; and
5 a final oxynitride layer, said final oxynitride layer formed from said
6 initial oxynitride layer by subjecting said initial oxynitride layer to a plasma
7 nitridation.

1 13. The gate dielectric of claim 12, wherein said final oxynitride layer
2 further has a reduction in effective electron mobility, μ_{eff} of less than 20% from the
3 effective electron mobility of said initial oxynitride layer.